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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/743,722	DUMITRAS ET AL.	
	Examiner	Art Unit	
	David N. Werner	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 March 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8,10-24,29 and 31-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,10-24,29 and 31-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *20100326*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office action for U.S. Patent Application 10/743,722 is responsive to communications filed 9 March 2010, in reply to the Non-Final Rejection of 9 December 2010. Claims 1–8, 10–24, 29, and 31–33 are pending.

2. In the previous Office action, Claims 34–53 were rejected under 35 U.S.C. 112, ¶ 2, as containing new matter. Claims 1–8, 10–17, and 29–33 were rejected under 35 U.S.C. § 101 as non-statutory. Claims 1, 5, 10–13, 18–22, 29, 33, 34, 38, 42–45, 50, and 53 were rejected under 35 U.S.C. § 103(a) as obvious over "Temporally Adaptive Motion Interpolation Exploiting Temporal Masking in Visual Perception" (*Lee*) in view of U.S. Patent Application Publication No. 2003/0142748 A1 (*Tourapis*). Claims 2, 6–8, 17, 35, 39–41, and 49 were rejected under 35 U.S.C. § 103(a) as obvious over *Lee* in view of *Tourapis* and in view of "Scene-Context Dependent Reference Frame Placement for MPEG Video Coding" (*Lan*). Claims 3, 4, 14, 23, 36, 37, and 46 were rejected under 35 U.S.C. § 103(a) as obvious over *Lee* in view of *Tourapis* and in view of U.S. Patent Application Publication No. 2002/0146071 A1 (*Liu*). Claims 15, 24, and 47 were rejected under 35 U.S.C. § 103(a) as obvious over *Lee* in view of *Tourapis* and in view of "MPEG Video Compression Standard" (*Mitchell*). Claims 16 and 48 were rejected under 35 U.S.C. § 103(a) as obvious over *Lee* in view of *Tourapis* and in view of "Digitale Bildcodierung" (*Ohm*). Claims 31 and 51 were rejected under 35 U.S.C. § 103(a) as obvious over *Lee* in view of *Tourapis* and in view of "Video Indexing Using MPEG Motion Compensation Vectors" (*Ardizzone*). Claims 32 and 52 were rejected

under 35 U.S.C. § 103(a) as obvious over *Lee* in view of *Tourapis* and in view of U.S. Patent Application Publication 2002/0012542 A1 (*van Overveld*).

Response to Amendment

3. Applicant's amendments to the claims have been fully considered. The claim rejections under 35 U.S.C. § 101 are withdrawn.

Response to Arguments

4. Applicant's arguments, see pp. 11–13, filed 9 March 2010, with respect to the rejection(s) of claim(s) 1, 10, 18, 29, and 33 under 35 U.S.C. § 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of U.S. Patent No. 7,058,130 B2 (*Liu*). *Liu* teaches a scene change detection system in a video encoder that directly compares magnitudes of motion vectors, or motion speed, to detect a scene change between frames.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States

only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1–6, 10–12, 14, 15, 18–21, 23, 24, 29, and 33 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 7,058,130 B2 (*Liu*). *Liu* teaches a video encoder. Regarding Claim 1, in *Liu*, figure 11 illustrates a sequence of pictures including a scene change. *Liu*, col. 11: ll. 28–37. Frame 1104 was originally scheduled to be encoded as an I-frame (col. 11: l. 31), and so may be considered a "reference frame". The frames following frame 1104, such as the frame at temporal distance n+1 and frame 1102 at temporal distance n+2 are shown in figure 11 as dependent on frame 1104 as a motion vector reference, and are the claimed plurality of pictures following a reference picture. The computation of the forward motion vectors from frame 1104, such as vectors 1112 and 1114 to frame 1102, is the claimed step of computing the motion vectors for each of the plurality of pictures following the reference picture. *Liu* then compares the motion vectors of pictures following a reference picture to determine if there are repeated fields or scene changes within these pictures. Figures 22–24 illustrate this process for detecting a scene change. *Id.* at col. 21: ll. 1–3. For example, in the fig. 22B embodiment, the ratio of the magnitudes of the motion vectors t0→t2 and t0→t1; and the motion vectors b0→b2 and b0→b1 are each compared with a threshold. *Id.* at col. 22: lines 8–31. Since a motion vector magnitude is by definition a "motion speed" as claimed, the calculation of the magnitudes of motion vectors t0→t1 and b0→b1 is the claimed calculation of the motion speed of a first picture in the plurality of pictures following a reference picture, and the calculation of the magnitudes of motion vectors t0→t2 and b0→b2 is the claimed calculation of the motion speed of another

picture in the plurality of pictures following the reference picture. The comparison of the ratios of the motion speeds with a threshold is the claimed comparison step between the motion speeds of the first picture in the plurality to the motion speeds of each of the other pictures, in this case, exactly one picture. If there is a scene change detected, as shown in figure 11, the picture between frames 1104 and 1102, corresponding with frame 2222–2225 in fig. 22b, is encoded as a B frame. This is the claimed encoding of the pictures exhibiting consistent motion speed, or steady or unchanging motion vector magnitude (col. 4: l. 62–col. 5: l. 6), as B pictures.

Regarding Claim 2, as shown in fig. 11 of *Liu*, the first frame after a detected scene change, frame 1102, is encoded as a P frame.

Regarding Claim 3, as shown in fig. 11 of *Liu*, when a scene change is detected at frame 1102, it is encoded as a P picture, and the frame between previous reference frame 1104 and scene change frame 1102 is encoded as a B frame.

Regarding Claim 4, it is a tautology that any picture is either encoded at full quality or a quality lower than full quality, or low quality.

Regarding Claims 5 and 6, although *Liu* uses scene change detection to force a new GOP when motion becomes inconsistent (col. 5: ll. 7–18) and changes scheduled encoding of pictures from original planned picture types (col. 11: ll. 28–37), in the absence of a scene change, *Liu* acts to encode pictures within each GOP in a regular sequence, with a maximum of two consecutive B pictures preceding a B picture and a maximum of eight inter pictures between I pictures.

Regarding Claim 10, as mentioned with respect to Claim 1, *Liu* discloses the claimed steps of calculating motion vectors for a first picture temporally closest to a reference picture, and determining the motion speed of the first picture, calculating motion vectors and motion speeds for additional pictures, comparing the motion speeds for consistency, and coding pictures as B or P pictures accordingly. A scene change is the claimed "termination condition".

Regarding Claim 11, in *Liu*, a ratio of motion vector magnitude, or motion speed, between a first frame following a reference frame and an additional frame, as described in col. 22: ll. 8–31, above a certain threshold, indicating an increase in motion speed, is the claimed termination condition that is met on inconsistent motion speed.

Regarding Claim 12, *Liu* is described in the title as a "scene change detection" system.

Regarding Claim 14, in a further embodiment of *Liu*, as shown in figure 10, the two frames immediately surrounding scene change frame 1002: frames 1001 and 1048, are encoded as P frames, as claimed. *Liu*, col. 10: l. 61–col. 11: l. 27.

Regarding Claim 15, in the figure 11 embodiment of *Liu*, the frames immediately adjacent to the scene change frame 1102 are shown as encoded as B frames.

Regarding Claim 18, figure 3B of *Liu* illustrates an encoder that performs the functions described elsewhere in the document. *Liu*, col. 7: ll. 4–16. Input frame buffer 354 is the claimed memory that stores pictures. Encoder 350 is the claimed video coder coupled to the memory. Field motion estimator 358 is the claimed motion vector

generator. Scene change detector 360 is the claimed colinearity detector. Encoder controller 366 illustrated as performing "mode decision" is the claimed picture type decision unit.

Regarding Claim 19, as in a conventional MPEG encoder, the *Liu* encoder encodes pictures as I frames, P frames, and B frames. *Liu*, col. 4: ll. 56–61.

Regarding Claim 20, figure 3B of *Liu* illustrates mode decision unit 366 as accepting as input motion vectors from motion estimator 358 via motion vector buffer 356.

Regarding Claim 21, in figure 3B of *Liu*, scene change detector 360 is the claimed "scene change detector".

Regarding Claim 23, in a further embodiment of *Liu*, as shown in figure 10, the two frames immediately surrounding scene change frame 1002: frames 1001 and 1048, are encoded as P frames, as claimed. *Liu*, col. 10: l. 61–col. 11: l. 27.

Regarding Claim 24, in the figure 11 embodiment of *Liu*, the frames immediately adjacent to the scene change frame 1102 are shown as encoded as B frames.

Regarding Claim 29, as mentioned with respect to Claim 1, *Liu* discloses the claimed steps of calculating motion vectors for a first picture temporally closest to a reference picture, and determining the motion speed of the first picture, calculating motion vectors and motion speeds for additional pictures, comparing the motion speeds for consistency, and coding pictures as B or P pictures accordingly. The step of provisionally scheduling a picture as an I frame, P frame, or B frame (col. 2: ll. 12–28;

col. 11: ll. 30–32) is the claimed step of adding a first picture in the sequence to a group of frames.

Regarding Claim 33, as mentioned with respect to Claim 1, *Liu* discloses the claimed steps of calculating motion vectors for a first picture temporally closest to a reference picture, and determining the motion speed of the first picture, calculating motion vectors and motion speeds for additional pictures, comparing the motion speeds for consistency, and coding pictures as B or P pictures accordingly. A scene change is the claimed "termination condition". The motion vectors are determined at a macroblock-level basis. *Liu*, col. 5: ll. 51–64.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 7, 8, 13, 17, and 22 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Liu* in view of "Scene-Context Dependent Reference Frame Placement for MPEG Video Coding" (*Lan*), cited in the Information Disclosure Statement filed 12 May 2004. Claims 7, 13, 17, and 22 are each directed to placing a P frame immediately preceding an I frame. *Liu*, in contrast, places a B frame immediately preceding an I frame.

Lan teaches a picture-type assignment algorithm. Regarding Claims 7, 13, 17, and 22, in *Lan*, whenever an I-frame is encoded, the previous frame is encoded as a P-frame. *Lan*, pg. 481: col. 1.

Liu discloses the claimed invention except it discloses ending a GOP with a B frame rather than a P frame. *Lan* teaches that it was known to use a P frame as the last frame in a scene. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to modify the system of *Liu* to use a P frame, rather than a B frame, for the final frame of a GOP or scene, as taught by *Lan*, since *Lan* states in pg. 481: col. 1 that such a modification would prevent the final frame of a scene from being dependent on unrelated data in the next new scene.

Regarding Claim 8, in *Liu*, the frames surrounding the scene change in the figure 10 embodiment are encoded "with fewer resources", presenting pictures of acceptable low quality "due to the lack of sensitivity of the human visual system near a scene change". *Liu*, col. 11: ll. 23–27.

9. Claim 16 is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Liu* in view of "Digitale Bildcodierung" (*Ohm*), cited in the Information Disclosure Statement of 17 July 2006. Claim 16 is directed to detecting a scene change according to the Normalization Cross-Correlation Function (NCCF), whereas *Liu* detects a scene change according to the ratio of the sum of motion vector magnitudes between two pictures. *Ohm* teaches NCCF, shown as equation 5.52. Regarding claim 16, NCCF is used in many pattern-matching applications, such as motion estimation (pg. 1). Two images,

$x_a(m_a, n_a)$, and $y_j(m_a, n_a)$, are compared over pixels (m_a, n_a) in area Λ. These are images $x_n(i, j)$ and $x_{n+1}(i, j)$ in area (M, N) in the present invention. Two pictures have the highest match when the NCCF is at a maximum (pg. 3), and correspondingly, two pictures have a low match, indicative of a scene change, when the value of NCCF is low.

Liu discloses the claimed invention except for using NCCF to determine correlation of two images. *Ohm* teaches that it was known to determine how closely two images match each other with Normalized Cross-Correlation. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to determine the correlation of two images using NCCF, as taught by *Ohm*, since *Ohm* states in page 4 that such a modification would allow for a more accurate comparison of the similarity of two images rather than by difference levels alone.

10. Claim 31 is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Liu* in view of "Video Indexing Using MPEG Motion Compensation Vectors" (*Ardizzone*). The magnitude of motion vectors, or motion speed, in *Liu*, is presumed to be given the Pythagorean or Euclidean district metric of the square root of the sum of the squares of the x and y components. However, in Claim 31, motion vector magnitude is given according to the Manhattan distance metric, or the sum of the x and y components. *Ardizzone* teaches a method for spatially segmenting an MPEG image with motion vectors (pg. 725, columns 1-2). In one step of *Ardizzone*, magnitudes of the motion vectors are built into a histogram to determine “dominant” regions of the image (pg. 727,

col. 2). If a motion vector has a large magnitude, this means that its macroblock is displaced a large distance, and so has a high speed. An experiment was performed to determine how best to retrieve related images to a given image, by matching motion vector characteristics (pg. 728: col. 2 – pg. 729, col. 1). Regarding claim 31, using a Manhattan distance metric yielded the best result (pg. 729, column 1).

Liu discloses the claimed invention except for defining pixel block displacement with a Manhattan distance metric. *Ardizzone* teaches that it was known to calculate motion vector magnitude with Manhattan distance. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to determine motion speed of an image based on the Manhattan distance metric, as taught by *Ardizzone*, since *Ardizzone* states in pg. 729: col. 1 that such a modification would produce the greatest accuracy in characterizing the motion vectors of the image.

11. Claim 32 is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Liu* in view of U.S. Patent Application Publication No. 2002/0012452 (*van Overveld*). Claim 32 is directed to calculating the Mean Absolute Value of blocks over a frame to determine motion speed consistency. In contrast, *Liu* directly looks at a ratio of the sum of the motion vector speeds of different pictures.

Van Overveld teaches a motion compensation system. Regarding Claim 32, *van Overveld* lists several common algorithms to determine a motion estimation error between a motion-compensated macroblock and an actual macroblock within an image.

These algorithms include the Mean Square Error (¶ 0049), the SAD (¶ 0051), the MAD (¶ 0053), and the Sum of Square Errors (¶ 0053).

Liu discloses the claimed invention except for calculating an MAD as a motion vector error. *Van Overveld* teaches that it was known to use a MAD instead of a motion speed ratio to determine motion estimation accuracy. Therefore, it would have been an obvious matter of design choice to determine motion consistency with the MAD rather than the motion speed ratio, since applicant has not disclosed in the specification, particularly paragraph [50], that the exact method of consistency calculation solves any stated problem or is for any particular purpose, and it appears that the invention would perform equally well with either consistency metric.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent No. 5,543,846 A (*Yagasaki*) teaches an encoder which presents a preferred pattern for frame coding type. U.S. Patent No. 6,940,903 B2 (*Zhao*) teaches an encoder with a scene change detector. U.S. Patent No. 7,110,452 B2 (*Katsavounidis*) teaches a video encoder that detects scene changes across multiple frames.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David N. Werner whose telephone number is (571)272-9662. The examiner can normally be reached on Monday-Friday from 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. N. W./
Examiner, Art Unit 2621

/Mehrdad Dastouri/
Supervisory Patent Examiner, Art Unit 2621